Project AC-Lab

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What AC-Lab is About

AC-Lab stands for **Attachment-Caregiving Lab** and implements a **Dimensional Attachment Model** (DAM) about the interactions between attacher and caregiver in a room (the lab).

The description of the DAM can be found in the manuscript ***Human Attachment as a Multi-Dimensional Control System: A computational Implementation***, currently submitted to *Frontiers in Psychology*. Reference theory can be found in ***How Our Caregivers Shape Who We Are: The Seven Dimensions of Attachment at the Core of Personality***.

In the current version, the DAM represents a mother as a white dot and a child as a black dot. They interact according to one of three possible attachment dimensions:

1. **Avoidance** (av) (corresponding to caregiver's insensitivity) (associated color: yellow);
2. **Ambivalence** (am) (corresponding to caregiver's unresponsiveness) (associated color: red);
3. **Phobicity** (ph) (corresponding to caregiver's hyper-protection) (associated color: green).

Nine dimensional levels are considered for simulation: 0.1, 0.2, …, 0.9. During interaction characterized by a given dimension, when the mother feels the need to give care, she becomes a colored star, while, when the child feels the need to receive care, they become a colored dot.

Quick start

Here, some directions on how to run the program are provided. In particular, the instructions to generate the diagrams included in the DAM-Manuscript are given. The program can perform numerous operations, of which more details can be found in the comments on the code.

First, set the folder 'AC_Lab_1.0' in the MATLAB path (with all subfolders). Launch commands from this directory in order to get files saved in folder 'OUTPUT_PLOTS_CURRENT'.

To plot 'The agents in the lab'
(standard mode, 100 iterations, every iteration displayed, no file saved):

- for Avoidance 0.1: run 'aclab_go('av01',0,100,1,0,0,0,false);'
- for Avoidance 0.5: run 'aclab_go('av05',0,100,1,0,0,0,false);'
- for Avoidance 0.9: run 'aclab_go('av09',0,100,1,0,0,0,false);'

- for Ambivalence 0.1: run 'aclab_go('am01',0,100,1,0,0,0,false);'
- for Ambivalence 0.4: run 'aclab_go('am04',0,100,1,0,0,0,false);'
- for Ambivalence 0.9: run 'aclab_go('am09',0,100,1,0,0,0,false);'

- for Phobicity 0.1: run 'aclab_go('ph01',0,100,1,0,0,0,false);'
- for Phobicity 0.5: run 'aclab_go('ph05',0,100,1,0,0,0,false);'
- for Phobicity 0.9: run 'aclab_go('ph09',0,100,1,0,0,0,false);'

Parameters:

1. Parameter 1 is the dimension and level.
2. Parameter 2 controls random numbers: 0 (default) to take numbers from saved mat file; 1 to take new generated numbers.
3. Parameter 3 is the number of iterations.
4. Parameter 4 is the output print/plot step (if 1, output is generated at each iteration; if x, output is generated each x iterations) (0 to generate only first and last).
5. Parameters 5 is the output print/plot start iteration.
6. Parameters 6 is the output print/plot end iteration.
7. Parameter 7 controls standard plotting: 1 (default) to plot below 'Behavioral patterns'; 0 to plot the lab; -1 not to plot.
8. Parameter 8 to true makes each iteration to be saved in a jpg file (folder 'OUTPUT_PLOTS_CURRENT', starting from the AC_Lab_1.0 directory).

Given the dimension 'dimXX', to plot/see each of 100 iterations and save the files from 90 to 100, run 'aclab_go('dimXX',0,100,1,90,100,0,true);' (e.g. 'aclab_go('av09',0,100,1,90,100,0,true);').

To plot 'Behavioral patterns'
(standard mode, 1000 iterations):

- for Avoidance 0.1: run 'aclab_go('av01',0,1000);'
- for Avoidance 0.5: run 'aclab_go('av05',0,1000);'
- for Avoidance 0.9: run 'aclab_go('av09',0,1000);'

- for Ambivalence 0.1: run 'aclab_go('am01',0,1000);'
- for Ambivalence 0.4: run 'aclab_go('am04',0,1000);'
- for Ambivalence 0.9: run 'aclab_go('am09',0,1000);'

- for Phobicity 0.1: run 'aclab_go('ph01',0,1000);'
- for Phobicity 0.5: run 'aclab_go('ph05',0,1000);'
- for Phobicity 0.9: run 'aclab_go('ph09',0,1000);'

To plot 'Mean values and trends':

- for Avoidance: run 'plot_reports(1,0,0)'
- for Ambivalence: run 'plot_reports(0,1,0)'
- for Phobicity: run 'plot_reports(0,0,1)'

To plot 'Simulated vs expected dynamics':

- for Avoidance: run 'plot_DYNAMICS_targets(1,0,0)'
- for Ambivalence: run 'plot_DYNAMICS_targets(0,1,0)'
- for Phobicity: run 'plot_DYNAMICS_targets(0,0,1)'

Program Structure

Files are divided into folders as follows:

1. **MAIN FILES**:
    a. **aclab_go.mat**: Main function, containing primary loop.
    b. **aclab_go_set.mat**: Setting of all main parameters.
    c. aclab_play_agents.mat: Main functions for the action of the agents.
    d. set_stats.mat: Setting of all global variables for keeping track of simulations.
    e. plot_stats.mat: Main plotting function (containing the screen printout and lab plotting).
2. **@caregiver**: Class for the caregiver agent.
3. **@child**: Class for the child agent.
4. **@iwm**: Class for the Internal Working Model (IWM). It models properties and methods for the stored attachment dimensions and caregiving features.
5. **@lab**: Class for the lab (environmental properties and methods).
6. **m-files**: auxiliary files, made to modularize code and simplify organization.
7. **plot_reports**: Additional files for plotting results.
8. **OUTPUT_PLOTS_CURRENT**: Contains files created in each simulation.
9. **OUTPUT_PLOTS_stored**: Contains stored files and movies for the most avoidant, ambivalent, and phobic cases. It includes a copy of the DAM-Manuscript plots.